



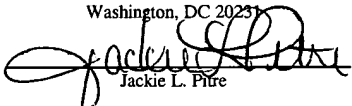
PATENT  
TH1947

#26  
Amended  
JB  
4/24/03

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.: 09/841,305  
Filing Date: April 24, 2001  
Inventors: Wellington et al.  
Title: IN SITU THERMAL  
PROCESSING OF A  
HYDROCARBON  
CONTAINING FORMATION  
WITH A SELECTED  
MOISTURE CONTENT

§ Examiner: J. J. Kreck  
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<p>CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8</p> <p>DATE OF DEPOSIT: <u>4/24/03</u></p> <p>I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail on the date indicated above and is addressed to:</p> <p>Commissioner for Patents Washington, DC 20231</p> <p> Jackie L. Pire</p>
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**AMENDMENT; RESPONSE SUBMITTED WITH  
REQUEST FOR CONTINUED EXAMINATION**

ATTN: BOX RCE  
Commissioner for Patents  
Washington, D.C. 20231

Sir:

Please amend the above-captioned application as follows:

In the Claims:

Below is a clean copy of amended claims. A marked-up copy of the amended claims is provided in an accompanying document.

Sub E1 FI 2040. (amended) The method of claim 2039, wherein the one or more heaters comprise at least two heaters, and wherein superposition of heat from at least the two heaters pyrolyzes at least some hydrocarbons within the part of the formation.

Sub E1 2047. (amended) The method of claim 2039, further comprising controlling the heat such that an average heating rate of the part of the formation is less than about 1 °C per day in a pyrolysis temperature range from about 270 °C to about 400 °C.

E2 2048. (amended) The method of claim 2039, wherein providing heat from the one or more heaters to at least the portion of the formation comprises:

heating a selected volume ( $V$ ) of the hydrocarbon containing formation from the one or more heaters, wherein the formation has an average heat capacity ( $C_v$ ), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day ( $P_{wr}$ ) provided to the selected volume is equal to or less than  $h \cdot V \cdot C_v \cdot \rho_B$ , wherein  $\rho_B$  is an average formation bulk density, and wherein an average heating rate ( $h$ ) of the selected volume is about 10 °C/day.

Sub E3 FI 2050. (amended) The method of claim 2039, wherein allowing the heat to transfer to the part of the formation heats the part of the formation to increase a thermal conductivity of at least a portion of the part of the formation to greater than about 0.5 W/(m °C).

Sub E4 FI 2062. (amended) The method of claim 2039, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises molecular hydrogen, wherein the molecular hydrogen is greater than about 10 % by volume of the non-condensable component at 25 °C and one atmosphere absolute pressure, and wherein the

*E<sup>4</sup>* molecular hydrogen is less than about 80 % by volume of the non-condensable component at 25 °C and one atmosphere absolute pressure.

*Sub F<sub>1</sub>*  
*E<sup>5</sup>* 2072. (amended) The method of claim 2039, wherein allowing the heat to transfer increases a permeability of a majority of the part of the formation to greater than about 250 millidarcy.

2073. (amended) The method of claim 2039, wherein allowing the heat to transfer increases a permeability of a majority of the part of the formation such that the permeability of the majority of the part is substantially uniform.

*Sub F<sub>1</sub>*  
2086. (amended) The method of claim 2078, further comprising controlling the heat such that an average heating rate of the part of the formation is less than about 1 °C per day in a pyrolysis temperature range of about 270 °C to about 400 °C.

*E<sup>6</sup>* 2087. (amended) The method of claim 2078, wherein providing heat from the one or more heaters to at least the portion of the formation comprises:

heating a selected volume ( $V$ ) of the hydrocarbon containing formation from the one or more heaters, wherein the formation has an average heat capacity ( $C_v$ ), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day ( $Pwr$ ) provided to the selected volume is equal to or less than  $h \cdot V \cdot C_v \cdot \rho_B$ , wherein  $\rho_B$  is an average formation bulk density, and wherein an average heating rate ( $h$ ) of the selected volume is about 10 °C/day.

*Sub F<sub>1</sub>*  
*E<sup>7</sup>* 2089. (amended) The method of claim 2078, wherein allowing the heat to transfer to the part of the formation heats the part of the formation to increase a thermal conductivity of at least a portion of the part of the formation to greater than about 0.5 W/(m °C).

*Sub F<sub>1</sub>*  
*E<sup>8</sup>* 2101. (amended) The method of claim 2078, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises molecular hydrogen, wherein the molecular hydrogen is greater than about 10 % by volume of the non-

E8  
condensable component at 25 °C and one atmosphere absolute pressure, and wherein the molecular hydrogen is less than about 80 % by volume of the non-condensable component at 25 °C and one atmosphere absolute pressure

E9  
Sub  
F1  
2111. (amended) The method of claim 2078, wherein allowing the heat to transfer increases a permeability of a majority of the part of the formation to greater than about 250 millidarcy.

2112. (amended) The method of claim 2078, wherein allowing the heat to transfer increases a permeability of a majority of the part of the formation such that the permeability of the majority of the part is substantially uniform.

Sub  
F1  
E10  
5398. (amended) A method of treating a hydrocarbon containing formation in situ, comprising:  
evaluating a moisture content of hydrocarbon containing material in the hydrocarbon containing formation to identify a portion of the hydrocarbon containing material with a moisture content that is less than about 20%;  
providing heat from one or more heaters positioned in heater wells to the portion to heat the portion so that an average temperature in the portion is above a temperature sufficient to pyrolyze hydrocarbon containing material in the portion; and  
producing a mixture from the formation.

Sub  
F1  
E11  
5403. (amended) The method of claim 5398, wherein providing heat from the one or more heaters to at least the portion of the formation comprises:  
heating a selected volume ( $V$ ) of the hydrocarbon containing formation from the one or more heaters, wherein the formation has an average heat capacity ( $C_v$ ), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and  
wherein heating energy/day ( $Pwr$ ) provided to the selected volume is equal to or less than  $h * V * C_v * \rho_B$ , wherein  $\rho_B$  is an average formation bulk density, and wherein an average heating rate ( $h$ ) of the selected volume is about 10 °C/day.